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STUDY ON COST BENEFIT ANALYSIS OF *HIBUSCUS ROSASINENSIS* INHIBITOR ON MILD STEEL

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ABSTRACT

Corrosion in today's era is one of the challenging issue in industry and if corrosion has to be be controlled then we need to find out an cost-effective resolution for the problematic. The life expectancy of appliances is determined from past experience and sales data. Improved corrosion design for appliances can increase their life expectancy. However, if improved corrosion protection would mean the use of more expensive components for the appliances, then consumers may not be interested. Hence Cost-benefit analysis is dignified for both the edges for corresponding inexpensive problems. The present paper deals with the corrosion cost benefit analysis estimation calculated with the corrosion current calculator by using the extract of Hibisucus rosasinensis. By the corrosion rate by using environment friendly inhibitor will be beneficial for the industry to tackle the problem of corrosion. The study proved that by using Hibisucus rosasinensis extract value for the higher concentration of 1.0 µl corrosion rate calculated was found to be 2.1 mpy which states approximately more than 90% of corrosion is inhibited and found to be very advantageous cost benefit to the Industries

Keywords: *Hibisucus rosasinensis, Cost Benefit Analysis, Mild Steel, Inhibitor*

INTRODUCTION

Corrosion problems are realized in most of the industries, it comes to corrosion the definition of corrosion varies considering the effect of corrosion. The corrosion is defined in various ways and estimation are done by the researchers on corrosion. In United states 120.2 million appliances are sold. People are rarely interested about knowing what exactly is corrosion and how the appliances are corroded due to not using the appliances in an exact manner. Cooling towers are general made of Mild Steel. In Cooling towers the heat is given out to the atmosphere mainly through one or more processes. It's a very important factor of an integrated cooling systems. The structures of cooling tower has pumps, valves and recirculating water piping. The heat rejected is due to the water evaporated within the cooling tower. The evaporation of a pound of water requires about 1000 btu, makes the evaporative cooling tower which is considered as the most important effective means of the heat which is discarded. It is said that 75% to 80% of the heat is removed from cooling water due to evaporation. The remaining heat is removed by shifting to the considerable air flow transitory through the cooling tower. For example, a 1000 ton rated cooling tower is designed to have a heat rejection of 12 million btu/hr, 12000 btu/hr/ton. At 80% heat rejection by evaporation, this unit will operate 26.55 gpd/ton or 26,500 gpd. (Timothy Keister, CWT, 2008.). In the cooling tower evaporation of water leads to increase in the concentration of dissolved salts which in turn leads to increase in corrosion and various other problems. However, if improved corrosion protection would mean the use of more expensive components for the appliances, then consumers may not be interested. Hence Cost-benefit analysis is dignified for both the edges for corresponding inexpensive problems. The present paper deals with the corrosion cost benefit analysis estimation calculated with the corrosion current calculator by using the extract of *Hibisucus rosasinensis*. By the corrosion rate by using environment friendly inhibitor will be beneficial for the industry to tackle the problem of corrosion. Dr. G H. Thanki, 2008 in his article commended on the loss due to corrosion to nation[5]. Sanjay K. Sharma, 2009 has specified about an overview of research on green inhibitors which is also known as

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environmentally friendly inhibitors and its significance in controlling corrosion on various materials[4]. A. L. Kavitha et.al, 2011 the study reveals about inhibiting on scale formation in cooling water systems[1]. The study proved that by using *Hibisucus rosasinensis* extract value for the higher concentration of 1.0 µl corrosion rate calculated was found to be 2.1 mpy which states approximately more than 90% of corrosion is inhibited and found to be very advantageous cost benefit to the Industries.

MATERIALS AND METHODS

For the evaluation of current density Electrochemical Measurements such as polarization resistance, and Electrochemical Impedance Spectroscopy results were used and corrosion current calculator was also used to know the rate of corrosion in miles per year.

RESULTS AND DISCUSSIONS

The below table details highlights about the rate off corrosion in the presence of the herbal inhibitor *Hibiscu.s rosasinensis.*

Table 1: shows Corrosion Rate (mpy) in the presence of inhibitor *Hibiscus rosasinensis*

Medium	Ecorr (mv/sec)	Icorr (Amp/cm2)	Corrosion Rate mpy
1M HCl	-0.486	8540	32014.1 mpy
0.001µl	-0.491	7010	81.38 mpy
0.1µl	-0.391	7.50	3.3 mpy
0.5 µl	-0.205	5.20	2.4 mpy
1.0 µl	-0.203	4.51	2.1 mpy

As far as the values are concerned it shows that as the concentration of inhibitor is increased the rate of corrosion rate (mpy) is decreased[2& 3]. The decrease in the corrosion rate is found at maximum concentration of 1.0µl for *Hibiscus rosasinensis* extract. The mild steel exposed in 1M HCl without the inhibitors was showing more corrosion rate mpy than the mild steel exposed in 1M HCl with the inhibitor. The corrosion rate of *Hibiscus rosasinensis* extract value for the higher concentration of 1.0 µl was found to be 2.1 mpy. The corrosion rate for *Hibiscus rosasinensis* found was compared with the BIS standard which states that the corrosion rate of 2.1mpy is acceptable range. This kind of similar observation was reported by Dawn C Eden, 2007 by using different inhibitor.

The results shown that *Hibiscus rosasinensis* shown good response in inhibiting stress corrosion and the corrosion rate values are decreased as the concentration range of inhibitor increased. The reduction in corrosion rate values is assumed that the system can be free from corrosion in the presence of inhibitor. There are variety of issues related to Mild steel for cooling water systems. The corrosion rate is measured and discussed in this study and provides a cost-effective method by proving the effectiveness of the herbal inhibitor action[2]. The corrosion rate values obtained by potential measurements showed in the inactive state of corrosion reactions other than with constant trend towards active corrosion reactions behaviour. This indicates that the *Hibiscus rosasinensis* inhibitor is working as a good inhibitor for the corrosion inhibition.

The cost-benefit analysis values are as delineated below:-

Name of Inhibitors:- *Hibiscus rosasinensis*

Volume of extract required:-360 ml annually (will vary according to nature of industry)

Cost of herbal inhibitor used:-Rs 5000/-

Cost of Chemical inhibitor used:-Rs 50,000/-

CONCLUSION AND RECOMMENDATION

The study deals with the calculation of corrosion rate by using corrosion rate calculator calculated for miles per year. The corrosion rate was calculated and the rate of corrosion for *Hibiscus rosasinensis* was 2.1 mpy. Hence it can concluded that *Hibiscus rosasinensis* is acting as an excellemt inhibitor

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against corrosion. The flower *Hibiscus rosasinensis* is very easily available in the market and the extract can be used as an environmental friendly inhibitor for corrosion. This methodology can be used in industries especially in cooling towers which are more prone to corrosion. In order to protect the system from corrosion we need to have proper knowledge and information about the materials ans and activities involved in the process.

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